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Hu

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[54] **STRUCTURE OF CARD PUNCH**

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[51] **Int. Cl.**[6] **B26F 1/14**

[52] **U.S. Cl.** **83/167**; 83/549; 83/618; 83/629; 83/687; 412/16; 412/38

[58] **Field of Search** 83/167, 549, 571, 83/629, 622, 618, 687; 402/1, 4; 412/16, 38

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Assistant Examiner—Charles Goodman
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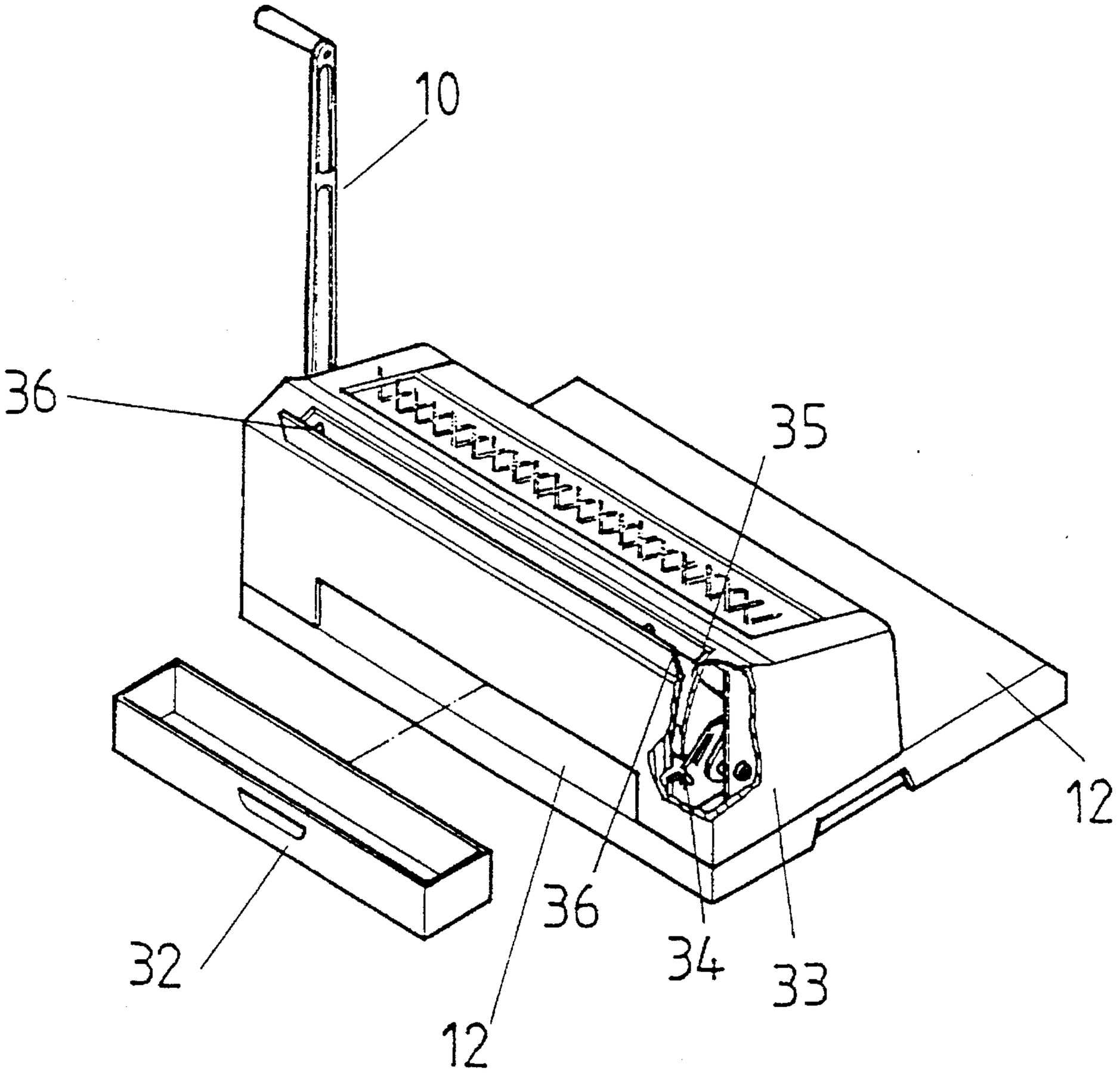
[57] **ABSTRACT**

A card punch of the type having a rectangular hole punching unit driven by an operating handle through a transmission shaft to punch rectangular holes on loose leaves, the improvement comprising two driven gears meshed with two drive gears at two opposite ends of the transmission shaft, a sliding bar driven by the driven gears to force circular punching elements into holes on locating frames, which are fixed to a guide plate between two upright end plates of the base of the card punch, to punch holes on paper being inserted into the locating frames.

6 Claims, 8 Drawing Sheets



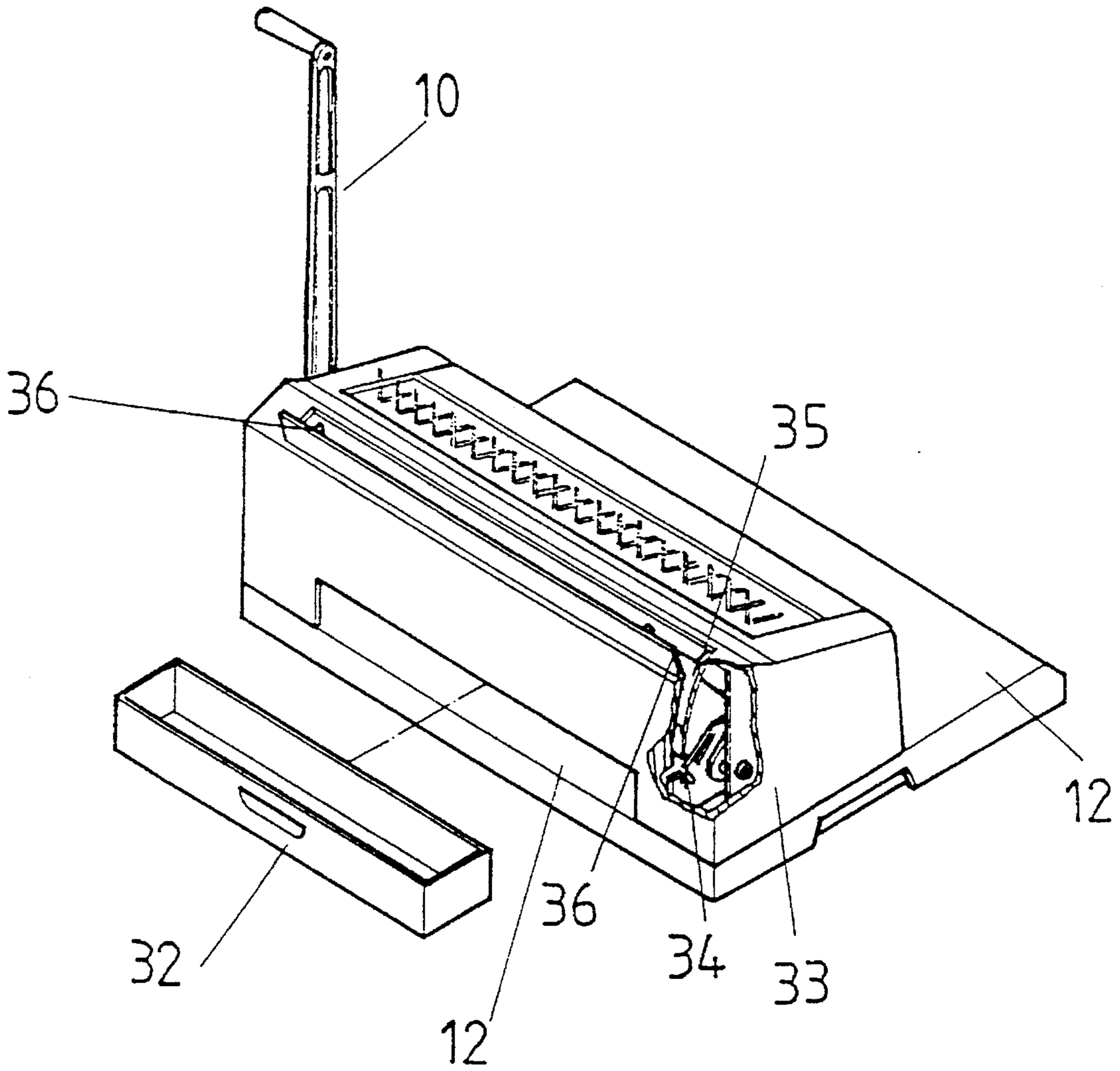


FIG. 1

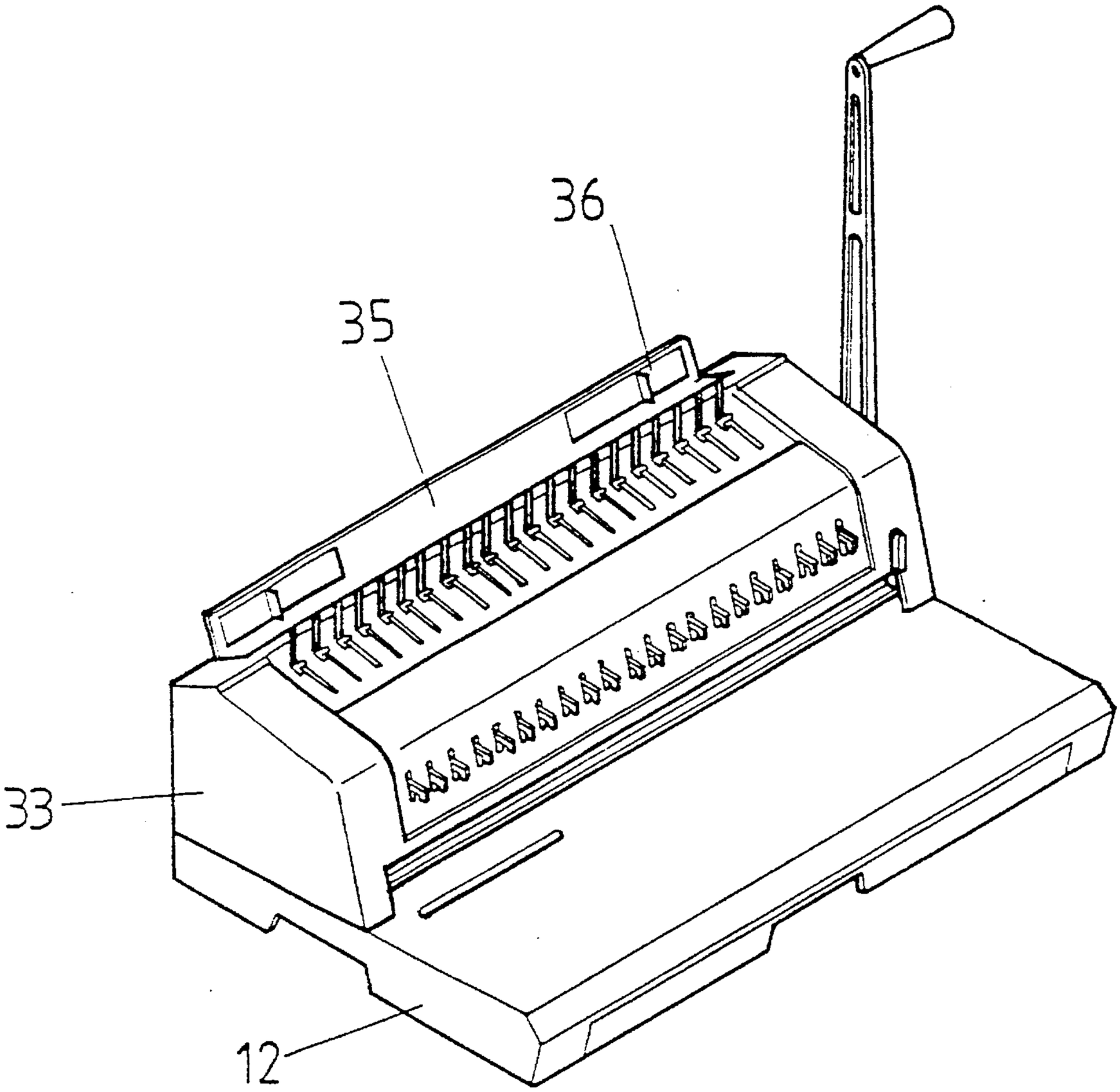


FIG. 2

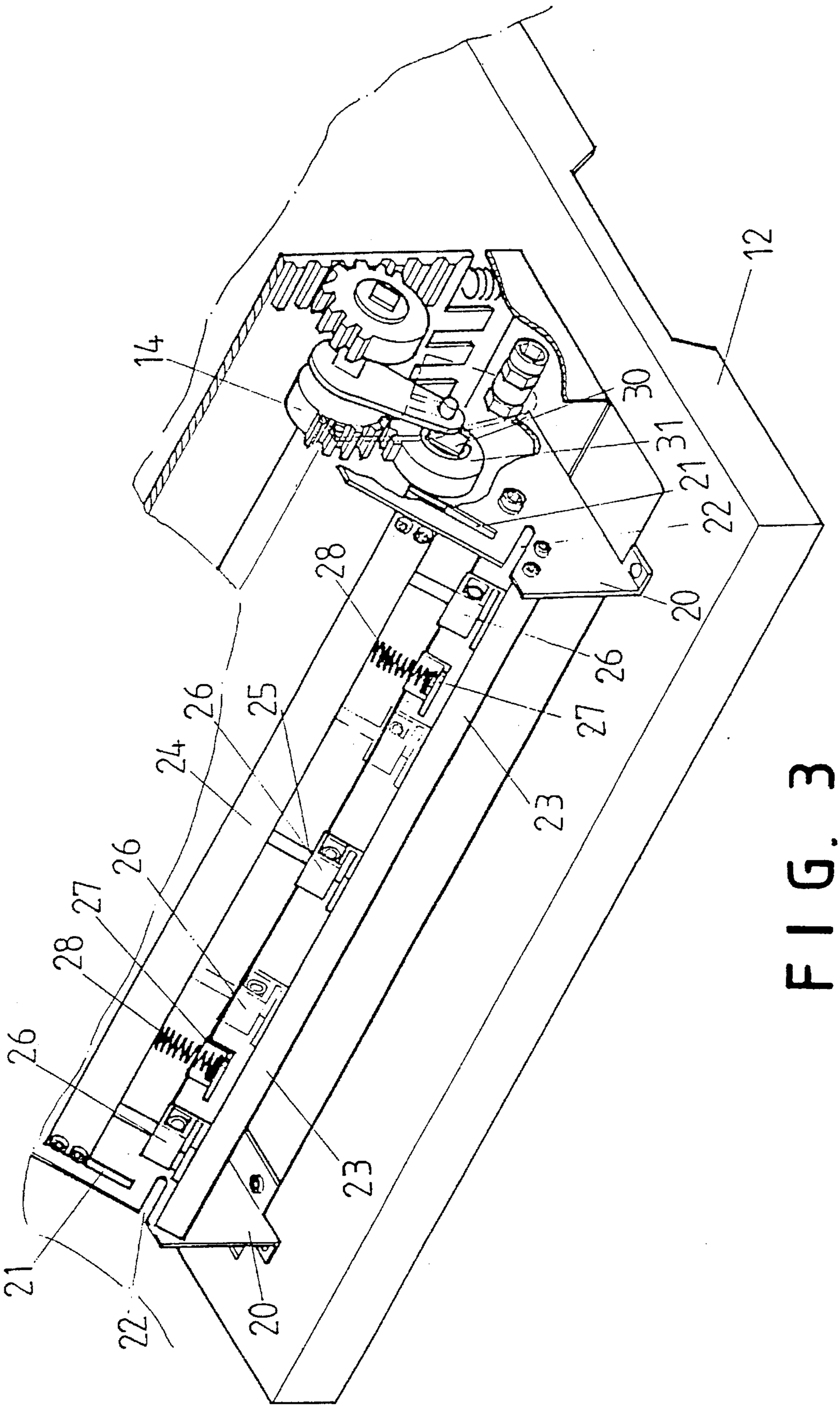


FIG. 3

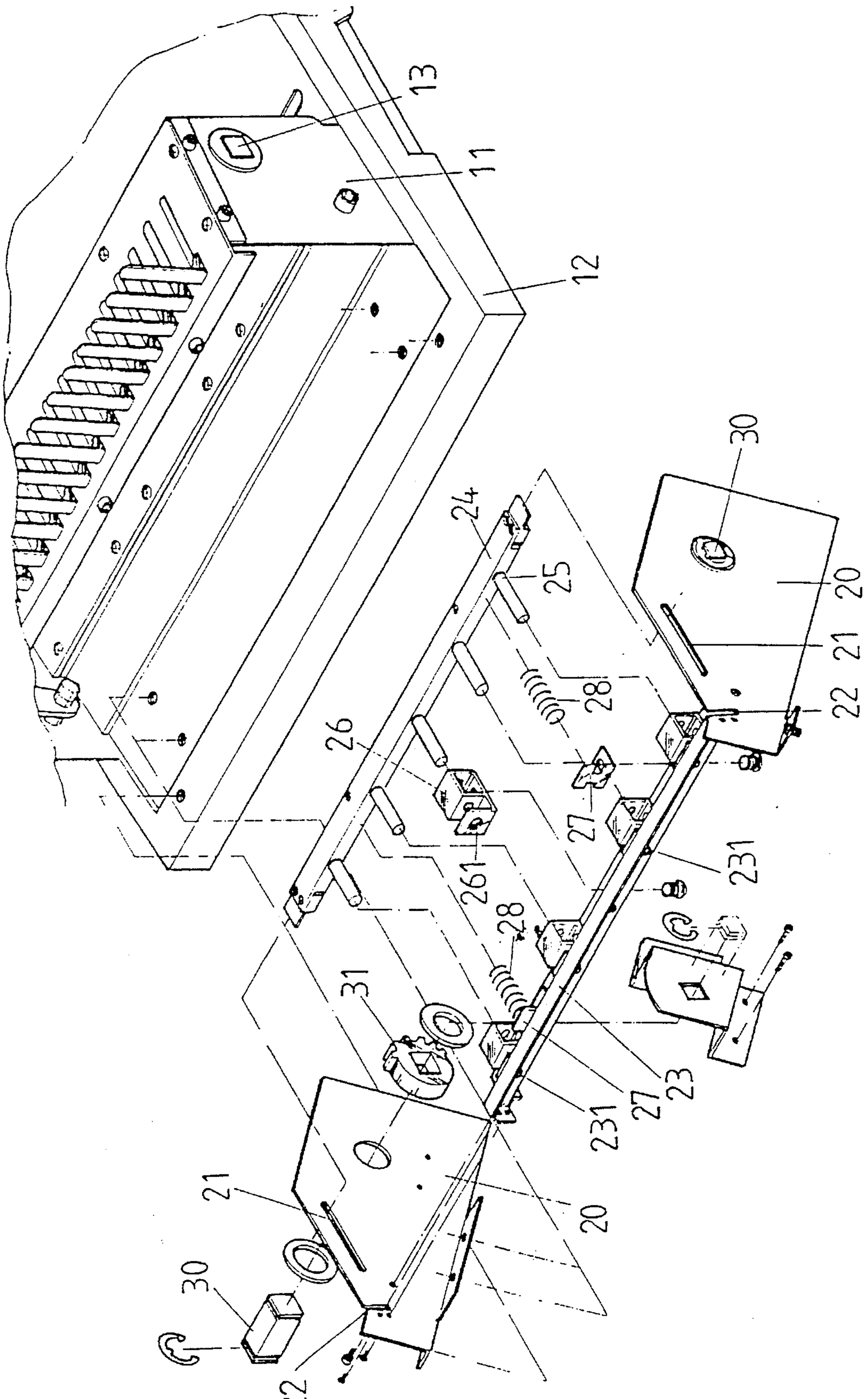


FIG. 4

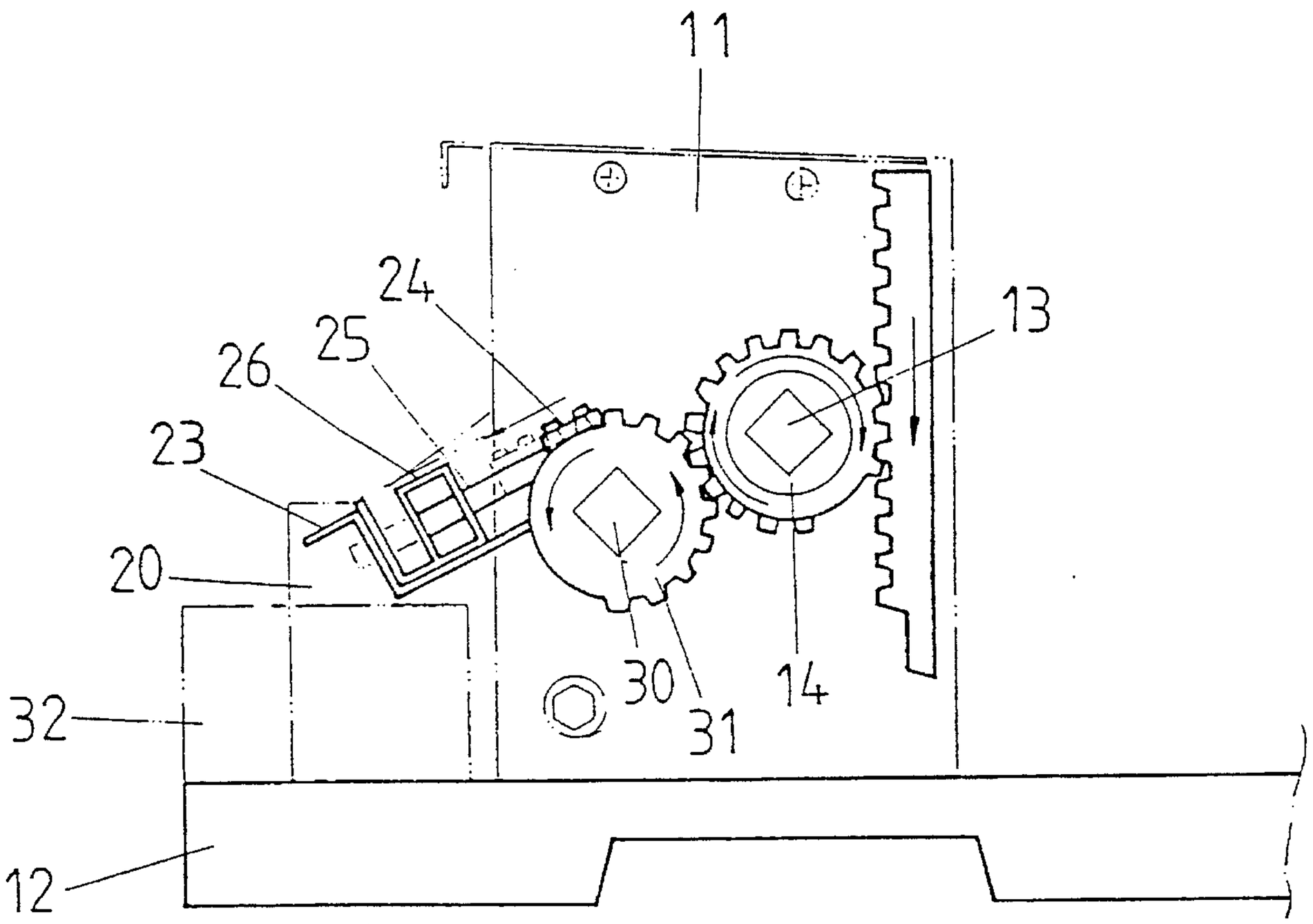
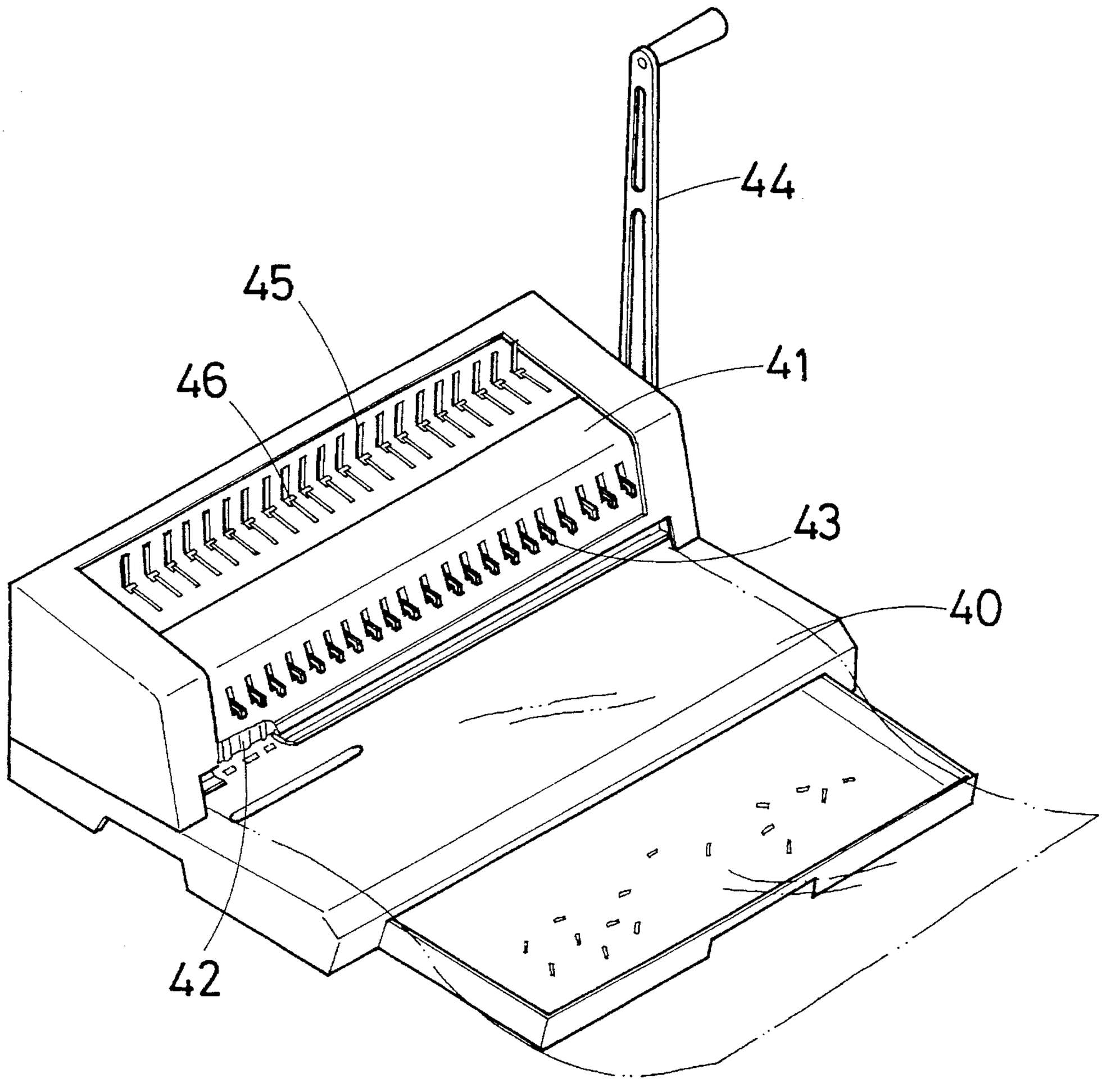
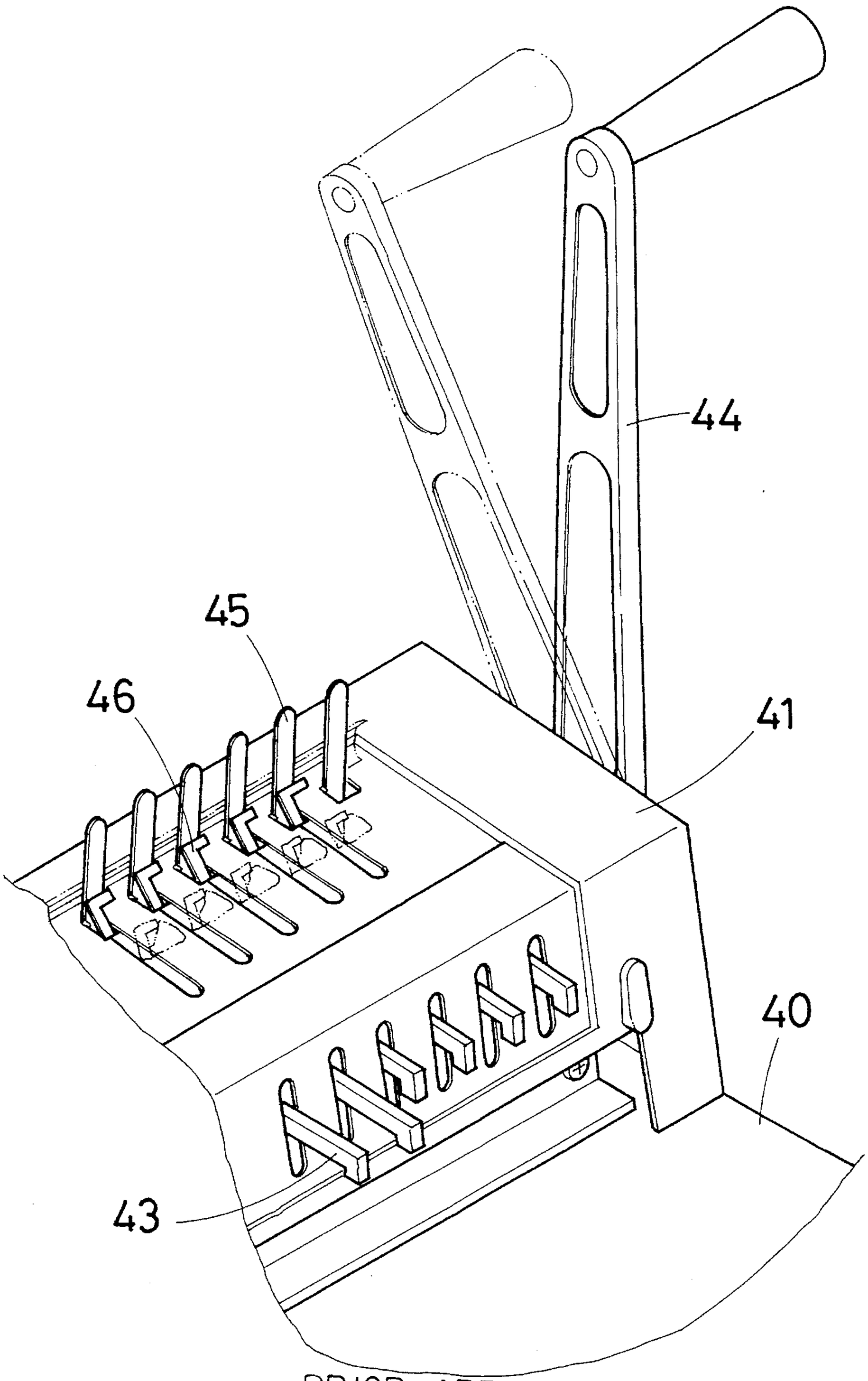


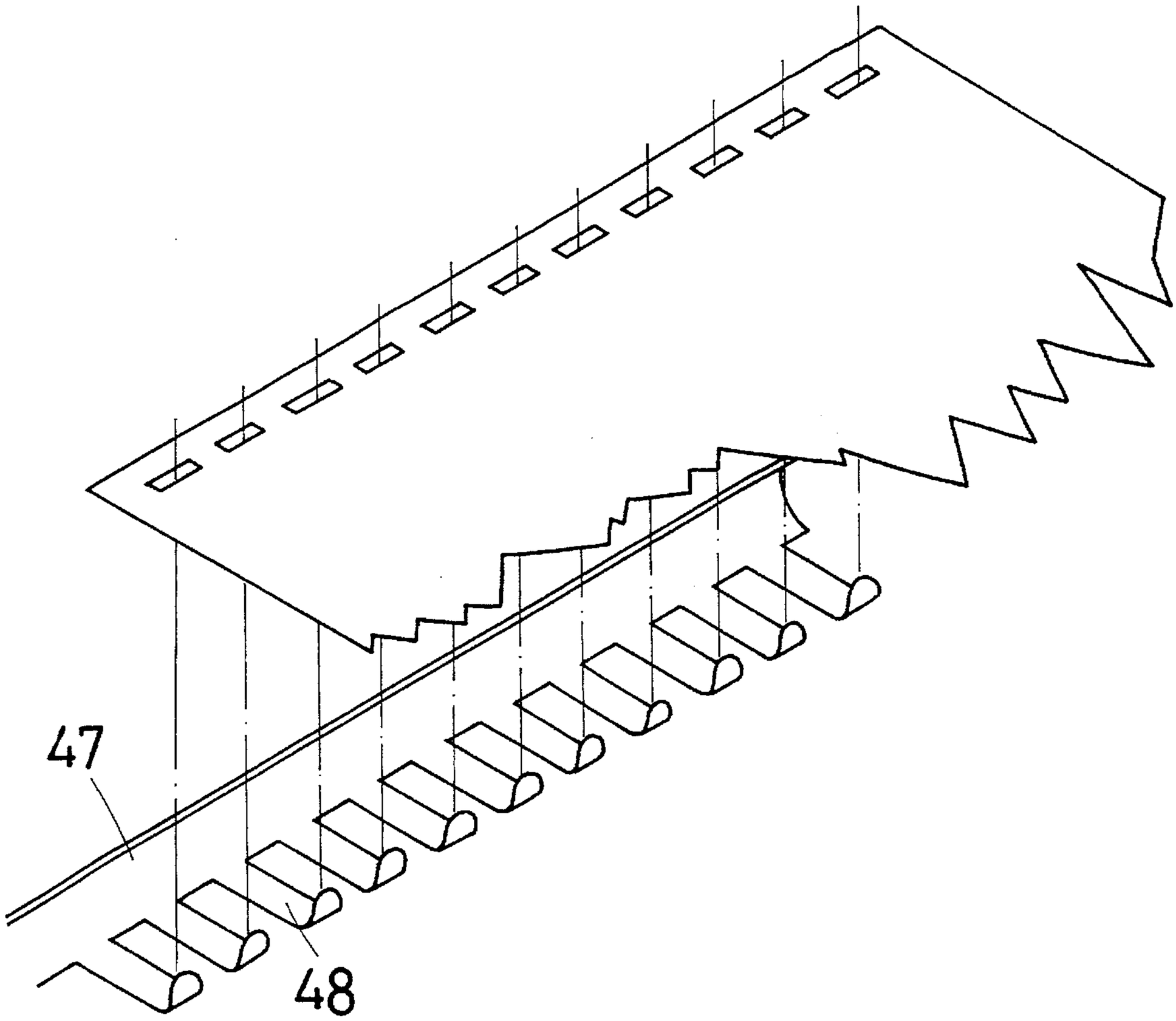
FIG. 5



PRIOR ART
FIG . 6



PRIOR ART
FIG. 7



PRIOR ART
FIG . 8

STRUCTURE OF CARD PUNCH

BACKGROUND OF THE INVENTION

The present invention relates to card punches, and relates more particularly to an improved structure of card punch which has a rectangular hole punching unit and a circular hole punching mechanism respectively operated by the same operating handle for punching rectangular holes or circular holes on paper.

Various card punches have been developed for punching holes on loose leaves, and have appeared on the market. FIGS. **6** and **7** show a rectangular hole card punch according to the prior art. This structure of card punch comprises a base **40**, a punching and binding unit **41** raised from the base **40**, a plurality of rectangular punching elements **42** driven by an operating handle **44** through a transmission mechanism (not shown) to punch paper, and a plurality of pull rods **43** respectively connected to the rectangular punching elements **42**. By means of the pull rods **43**, the rectangular punching elements **42** can be selectively moved out of the respective operating position so that the operating handle will not be able to drive the respective punch element(s) that are in the inoperative position. The punching and binding unit **41** further comprises a row of projecting rods **45**, and a row of actuating rods **46** moved by the operating handle **44** relative to the projecting rods **45** for binding punched sheets of paper on the flat teeth **48** of a loose-leaf clip **47** (see FIG. **8**). When the operating handle **44** is turned in one direction, the actuating rods **46** are moved forwards from the projecting rods **45** to open the loose-leaf clip **47** for permitting punched loose leaves to be loaded on the flat teeth **48** of the loose-leaf clip **47**. When the operating handle **44** is turned in the reversed direction, the actuating rods **46** are moved backwards to the projecting rods **45** to close the loose-leaf clip **47**, and therefore the punched loose leaves are fastened to the loose-leaf clip **47**.

The aforesaid rectangular hole card punch is functional. However, this structure of rectangular hole card punch is applicable only for punching rectangular holes on paper. Loose leaves with rectangular binding holes cannot be firmly retained together by a loose-leaf clip with circular teeth. Therefore, when a loose-leaf clip with circular is used to fasten sheets of paper together, these sheets of paper must be punched by a card punch with circular punching elements. Regular card punches with circular punching keys are not adjustable. For punching different numbers of binding holes on paper, different card punches with different numbers of circular punching elements have to be separately used.

SUMMARY OF THE INVENTION

The present invention has been accomplished under the circumstances in view. It is therefore the principal object of the present invention to provide an improved structure of card punch which is applicable for punching circular holes as well as rectangular holes on paper. It is another object of the present invention to provide a multipurpose card punch which is simple in structure. According to the present invention, a circular hole punching mechanism is installed in a regular rectangular hole card punch, which is operated by an operating handle through a transmission shaft to drive rectangular punching elements into paper. The circular hole punching mechanism comprises two driven gears meshed with two drive gears at two opposite ends of the transmission

shaft, a sliding bar driven by the driven gears to force circular punching elements into holes on locating frames, which are fixed to a guide plate between two upright end plates of the base of the card punch, to punch holes on paper being inserted into the locating frames.

Other objects of the invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists of features of constructions and method, combination of elements, arrangement of parts and steps of the method which will be exemplified in the constructions and method hereinafter disclosed, the scope of the application of which will be indicated in the claims following.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a cutaway of a card punch according to the present invention;

FIG. **2** is an elevational view of the card punch shown in FIG. **1**;

FIG. **3** is a perspective view of the rear part of the card punch shown in FIG. **1**, showing the installation of the circular hole punching mechanism;

FIG. **4** is an exploded view of the circular hole punching mechanism shown in FIG. **3**;

FIG. **5** is a side view in plain of the circular hole punching mechanism shown in FIG. **3**, showing the linear movement of the sliding bar relative to the rotary motion of the driven gears;

FIG. **6** is a perspective view of a card punch according to the prior art;

FIG. **7** is a partial view in an enlarged scale of FIG. **6**; and

FIG. **8** shows the positioning of a punched card on a loose-leaf paper clip.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

For the purpose of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawings. Specific language will be used to describe same. It will, nevertheless, be understood that no limitation of the scope of the invention is thereby intended, such alternations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated herein being contemplated as would normally occur to one skilled in the art to which the invention relates.

Referring to FIGS. **1**, **2**, **3**, and **4**, two upright end plates **20** are securely fixed to the base **12** and disposed at one side by the rectangular hole punching unit **11**, which is operated by an operating handle **10**. The upright end plates **20** are symmetrical, each having an elongated guide slot **21** and an elongated locating slot **22** substantially disposed at right angles. A guide plate **23** is securely connected between the end plates **20**, having a plurality of circular through holes **231** spaced from one another at a predetermined pitch. A hollow sliding bar **24** is provided having two opposite ends inserted into the elongated guide slots **21** on the end plates **20**. A plurality of circular punching elements **25** are respectively perpendicularly fastened to the sliding bar **24** at locations corresponding to the circular through holes **231** on the guide plate **23**. A plurality of locating frames **26** are respectively fixed to the guide plate **23**, having a respective circular guide hole **261** respectively aligned with the circular through holes **231** on the guide plate **23**. When the sliding

bar **24** is installed, the circular punching elements **25** are respectively inserted into the circular guide holes **261** on the locating frames **26**. A plurality of angle plates **27** are securely fixed to the guide plate **23** at suitable locations. A plurality of springs **28** are provided, each having one end secured to one angle plate **27** and an opposite end fixed to the sliding bar **24**. The springs **28** support the sliding bar **24** in the upper limit position.

Referring to FIG. **5** and FIG. **3** again, two square shafts **30** are respectively revolvably mounted on the end plates **20** to hold a respective driven gear **31**. The driven gear **31** is securely mounted around one square shaft **30** and meshed with a respective drive gear **14** at one end of the transmission shaft **13** of the oblong hole punching and binding unit **11**. When the transmission shaft **13** is rotated by the operating handle **10**, the drive gears **14** at the two opposite ends of the transmission shaft **13** are simultaneously rotated to turn the driven gears **31**, causing the sliding bar **24** to move downwards along the elongated guide slots **21** on the end plates **20**. On the contrary, when the transmission shaft **13** is returned to its former position, the drive gears **14** are driven to turn the driven gears **31** in the reversed direction, causing the sliding bar **24** moved upwards along the elongated guide slots **21** on the end plates **20**. During the down stroke of the sliding bar **24**, the punching elements **25** are forced into the circular guide holes **261** on the locating frames **26** and the circular through holes **231** on the guide plate **23**, and therefore the sheets of paper which are inserted into the locating frames **26** are punched. Furthermore, there is provided a cover shell **33** covered over the aforesaid circular hole punching mechanism and the rectangular hole punching unit **11**, and a tray **32** disposed below the guide plate **23** to collect paper chips.

Referring to FIG. **3** again, the circular punching keys **25** and the locating frames **26** may be respectively disconnected from the sliding bar **24** and the guide plate **23** and then secured to the sliding bar **24** and the guide plate **23** at desired locations to change the pitches among the circular punching elements **25**.

Referring to FIGS. **1**, **2**, and **3** again, a sheet guide **35** is made on the cover shell **33** at the top for guiding the paper to be punched into a paper slot **34**, which guides the paper to be punched to the locating frames **26** for punching. The sheet guide **35** has paper guides **36**, which enable straight paper loading.

While only one embodiment of the present invention has been shown and described, it will be understood that various modifications and changes could be made without departing from the spirit and scope of the invention.

The invention is naturally not limited in any sense to the particular features specified in the forgoing or to the details of the particular embodiment which has been chosen in order to illustrate the invention. Consideration can be given to all kinds of variants of the particular embodiment which has been described by way of example and of its constituent elements without thereby departing from the scope of the invention. This invention accordingly includes all the means constituting technical equivalents of the means described as well as their combinations.

I claim:

1. A card punch comprising a base, an operating handle, a rectangular hole punching unit mounted on said base and driven by said operating handle to punch paper, said rectangular hole punching unit comprising a transmission shaft coupled to said operating handle, a series of rectangular punching elements, and a plurality of links connected between said rectangular punching elements and said transmission shaft, and a circular hole punching mechanism, and a cover shell covered over said circular hole punching mechanism and said rectangular hole punching unit, wherein said circular hole punching mechanism comprises:

two drive gears fixedly mounted around two opposite ends of said transmission shaft;

two upright end plates securely fixed to said base, each upright end plate having a respective elongated guide slot and an elongated locating slot;

two square shafts revolvably mounted on said upright end plates;

two driven gears securely mounted around said square shafts and meshed with said drive gears;

a guide plate securely connected between said end plates, having a plurality of circular through holes spaced from one another at a predetermined pitch;

a plurality of locating frames respectively fixed to said guide plate, each frame having a circular guide hole aligned with one of the circular through holes in said guide plate;

a hollow sliding bar having two opposite ends inserted into the elongated guide slots on said end plates, said sliding bar being moved up and down along the elongated guide slots on said end plates by said driven gears when said transmission shaft is driven by said operating handle to turn said drive gears; and

a plurality of circular punching elements respectively perpendicularly fastened to said sliding bar and respectively inserted into the circular guide holes on said locating frames and driven by said sliding bar to punch paper being inserted into said locating frames.

2. The card punch of claim **1** wherein said cover shell comprises a sheet guide and a paper slot for guiding paper into said locating frames for punching.

3. The card punch of claim **2** wherein said sheet guide has two paper guides, which enable straight paper loading.

4. The card punch of claim **1** wherein said circular hole punching mechanism further comprises a plurality of angle plates securely fixed to said guide plate and a plurality of springs connected between said angle plates and said sliding bar.

5. The card punch of claim **1** wherein said sliding bar has a series of mounting holes corresponding to the circular through holes on said guide plate for mounting said circular punching keys.

6. The card punch of claim **1** further comprising a tray received in said cover shell below said guide plate for collecting paper chips.

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